

# PATENT COOPERATION TREATY

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### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>PCT013RN</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/IN 2004/000014</b>	International filing date (day/month/year) <b>20 January 2004 (20.01.2004)</b>	Priority Date (day/month/year) <b>20 January 2003 (20.01.2003)</b>
International Patent Classification (IPC) or national classification and IPC  <b>IPC<sup>7</sup>: F17C 11/00, C01B 3/00</b>		
Applicant <b>VELLORE INSTITUTE OF TECHNOLOGY</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examination Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of   4   sheets, including this cover sheet.  
  
☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of            sheets.

3. This report contains indications relating to the following items:

- I. ☒ Basis of the opinion
- II. ☐ Priority
- III. ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV. ☐ Lack of unity of invention
- V. ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI. ☐ Certain documents cited
- VII. ☐ Certain defects in the international application
- VIII. ☐ Certain observations on the international application

Date of submission of the demand  <div style="text-align: center;">16.08.2004</div>	Date of completion of this report  <div style="text-align: center;">6 December 2004 (06.12.2004)</div>
Name and mailing address of the IPEA/AT Austrian Patent Office Lresdner Straße 87 A <del>206</del> Vienna Facsimile No. 1/53424/200	Authorized officer  <div style="text-align: center;">MEISTERLE P.</div> Telephone No. 1/53424/414

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/IN 2004/000014

## I. Basis of the report

1. With regard to the elements of the international application:\*

☒ the international application as originally filed

☐ the description:

pages \_\_\_\_\_, as originally filed

pages \_\_\_\_\_, filed with the demand

pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

☐ the claims:

pages \_\_\_\_\_, as originally filed

pages \_\_\_\_\_, as amended (together with any statement) under Article 19

pages \_\_\_\_\_, filed with the demand

pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

☐ the drawings:

pages \_\_\_\_\_, as originally filed

pages \_\_\_\_\_, filed with the demand

pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

☐ the sequence listing part of the description:

pages \_\_\_\_\_, as originally filed

pages \_\_\_\_\_, filed with the demand

pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages \_\_\_\_\_.

☐ the claims, Nos. \_\_\_\_\_.

☐ the drawings, sheets/fig \_\_\_\_\_.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as „originally filed“ and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/IN 2004/000014

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)

Claims 1-27

YES

Claims ----

NO

Inventive step (IS)

Claims 1-27

YES

Claims ----

NO

Industrial applicability (IA)

Claims 1-27

YES

Claims ----

NO

Citations and explanations (Rule 70.7)

The following documents are cited in the search report:

D1: US 5817157 A (Category: A)

D2: US 4988486 A (Category: A)

Other than the document D2 which is regarded as a general state of the art document only, the retrieved patent D1 is considered to be a more relevant document. It concerns a system for the production, storage and dispensation of hydrogen, said system comprising: (a) at least a sealed and replaceable cylinder filled with water having a lid, mounted vertically on a platform, (b) a container to store encapsulated metal hydride shells, (e) a slider member having a passage, said passage in flow communication with a slider path to transmit the encapsulated metal hydride shells from the container into the cylinder, (f) a plurality of baffles adapted to regulate and direct the flow of the encapsulated metal hydride shells of the container on to the slider path through said passage, (g) a movable ramming means including a disintegrating site to receive the encapsulated metal hydride from the slider and a movable piston for the disintegration and dispersion of broken shells and metal hydride into the cylinder, (h) a motion transmitting element mounted on the ramming means connected to outer baffles to provide a corresponding rotatable action, (i) an outlet disposed on the cylinder to release the hydrogen thus produced in the cylinder, and a control panel to control the operations of the system. Comparing these known features with the features of the present claim 1 it can be stated that the following essential features thereof are not disclosed in said document D1: (c) a lid having a moist separation mesh serving as a passage for the hydrogen flow, fixed on top of the cylinder as inlet means for encapsulated metal hydride shells and water before said cylinder is sealed and mounted on the platform, and (d) a slider base member disposed at the bottom end of the cylinder said slider is fixed to the inner surface of the cylinder, on both the sides, by supporting rings. Consequently, the independent claim 1 is regarded to be novel and to include an inventive step.

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Box V (page 1)

Furthermore, the following features of the dependent claims 2-19 are described in the aforementioned document: the container is made of material selected from mild steel and stainless steel; the ramming means consisting of a movable piston and a cavity at the end to facilitate the disintegration of encapsulated shells; the metal content for metal hydride is selected from Sodium, Boron, Lithium, Potassium and magnesium with aluminum or any metal hydride capable of releasing hydrogen; the encapsulated metal hydride shells having shapes selected from spherical, cylindrical, rectangular and square, preferably spherical; the encapsulation of metal hydrides is done using the polymeric material selected from polystyrene, poly methyl methacrylate (PMMA), PVC with less plasticizer, HDPE, brittle poly olefins, preferably polystyrene and PMMA; the power means consisting of a hydraulic pack and the hydraulic cylinders with suitable sealing mechanism to prevent leakage during reciprocating motion of the piston while disintegrating the encapsulated metal hydride shells; the ramming means crushes the metal hydride shells into small and tiny debris that are collected at the bottom of the container for easy disposal and recycling; the accumulation of disintegrated pieces of encapsulated metal shells facilitates in creating a space in the container itself for storing and dispensing of hydrogen; the ramming means can be directed to crush the encapsulated metal hydride shells facilitating in creating a space in the container itself for storing and dispensing of hydrogen; the ramming means can be directed to crush the encapsulated metal hydride shells in any selected cylinder connected to the system; Finally some aspects of the present method for the production, storage and dispensation of hydrogen using the apparatus described above according to the dependent claims 20-27 are disclosed comprising the steps of (a) mounting the sealed cylinders on the platform filled with a proportionate quantity of water and a container with encapsulated metal hydrides, (b) directing the encapsulated metal hydride into the ramming means by means of baffles disposed on the container and crushing the desired quantities of encapsulated metal hydride shells to disintegrate into small pieces; (c) dispersing the metal hydride into the water; (d) reacting the metal hydride with water to produce hydrogen; (e) releasing the hydrogen through outlet means provided at the top of the cone and container; and (f) collecting the disintegrated pieces and the byproducts at the bottom of the Potassium and magnesium with an addition aluminum hydride; wherein the aluminum that is used in powder form is in the range of 5-50% to increase the density of the metal hydride and also to produce more hydrogen per unit volume by reacting with an alkali, preferably sodium and; wherein the byproducts consisting of NaOH and alumina. Due to the fact that the independent claim 1 is new and includes an inventive step on one hand and the features of the independent claims 2-27 specify preferred embodiments of the subject matter of said claim 1 on the other hand, the features of the claims 2-27 are consequently considered to be new and to involve an inventive step, too.

Summarizing, the above cited documents merely define the state of the art more or less.

The industrial applicability is given too.